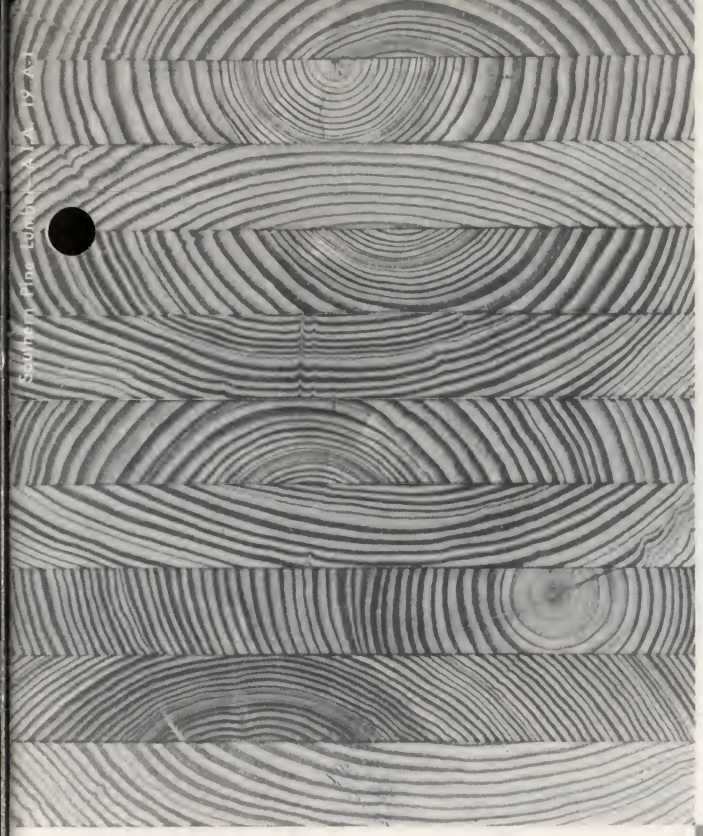


Technical Data on SOUTHERN PINE

SOUTHERN PINE

ARCHITECT'S BULLETIN

No. 8

in this issue . . .

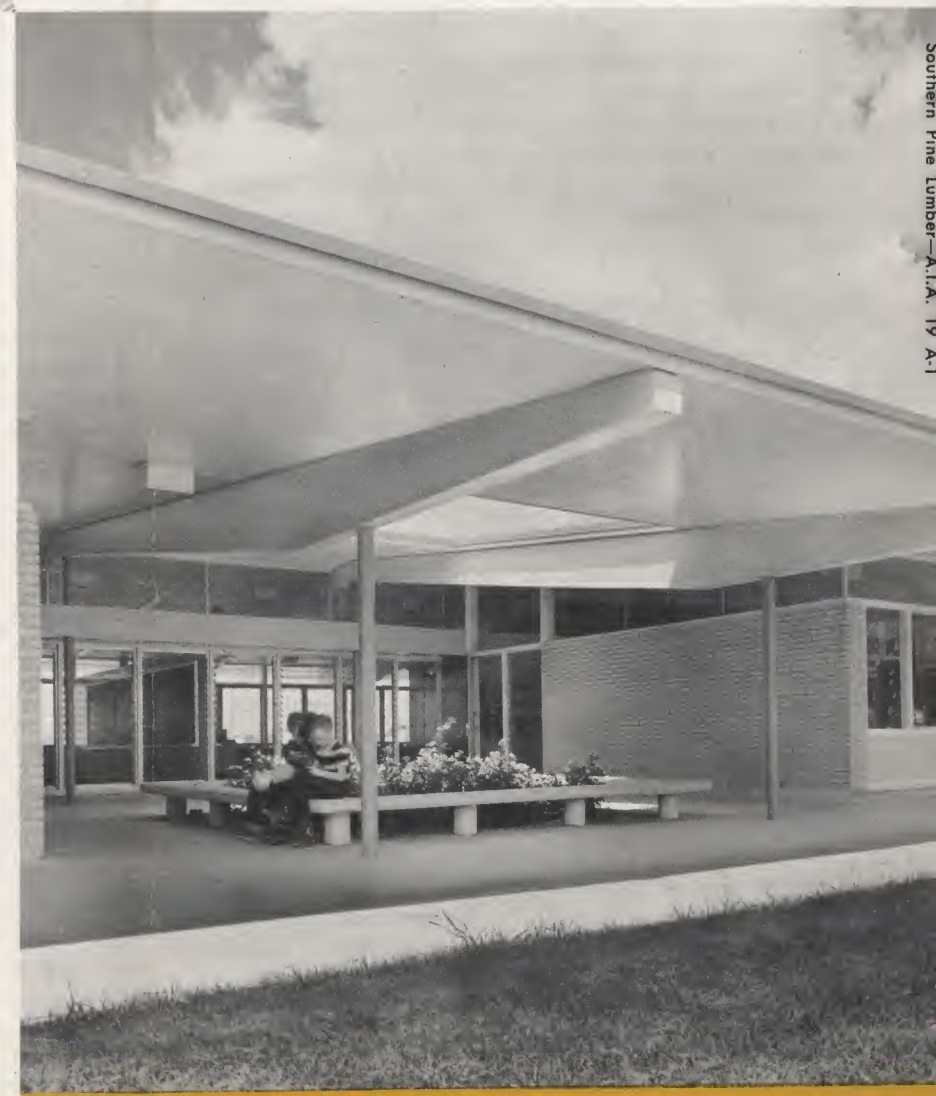
Glued laminated lumber

Design Information

Specifications

Finishes

Properties of beams



NEW AUSTIN SCHOOL
EDNA, TEXAS
Architects—Caudill, Rowlett & Scott

GLUED LAMINATED SOUTHERN PINE

NEW AUSTIN SCHOOL, EDNA, TEXAS
Architects—Caudill, Rowlett & Scott

Glued laminated Southern Pine arches and beams offer the architect unlimited opportunity for dramatic expression of form and taste in building design. The versatility and unrestricted use of this type of construction is shown by some of the buildings pictured in this bulletin.

The unmatched charm and warmth of wood, the inherent fire resistive advantages of heavy timber construction, and the versatility and economy of lumber are features possessed by laminated construction. Southern Pine is especially suitable for laminated structures because of its high strength, adaptability to bending without cracking or splintering, and the ease with which any desired finish can be obtained.

THE LAMINATION PROCESS

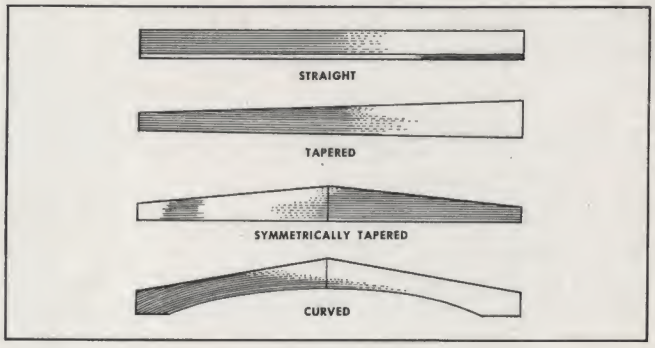
Glued laminated lumber can be produced in any dimension or length using kiln-dried lumber of nominal thickness 2″ or less. While straight beams are usually built up from 1 5/8″ laminations (2″ nominal) arches and curved beams are fabricated of either 1″ or 2″ nominal lumber. Southern Pine permits a thickness of laminations to radius of curvature ratio (t/r) of 1/100, however, the recommended minimum bending radii is 7′-0″ and 15′-0″ respectively for laminations 25/32″ (1″ nominal) and 1 5/8″ (2″ nominal) in thickness.

Prior to laminating horizontally, individual boards should be end glued by means of scarf joints, then surfaced to assure uniform thickness throughout the length and width of laminations. This pre-gluing of scarf joints and surfacing operation is recommended to insure maximum glue bond strength.

After spreading glue on the surface of the prepared full length laminations, the structural units are then formed by a process of forcing the glued laminations under high pressure to the desired shape. Structural glues are of a water-resistive type for all interior structures and of a waterproof type for exterior exposure.

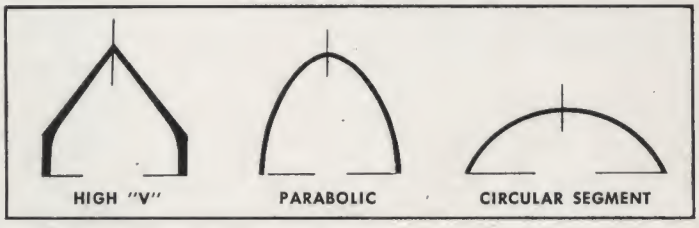
The greater strength of a laminated wood construction as compared with solid lumber of the same grade results primarily from two factors—dispersion of defects and the higher strength of dry wood.

BEAMS



Three basic types of beams are fabricated — straight, tapered and curved. Straight and tapered beams are usually fabricated with a slight camber as an allowance for normal deflection and improved appearance.

ARCHES



The three-hinged arch, which is the logical structural form for large span members, may be straight, circular or of varying curvature.

The glued laminating process permits the shaping of an arch to any desired form. The "V" type arch allows maximum utilization of enclosed space. Segmental and buttressed arches provide for maximum economy, particularly in the long spans. A recent outstanding achievement in the design and fabrication of a buttressed type arch is the structural framework for the Jai-Alai Fronton in West Palm Beach, Florida. With a span of over 242′, which is the world's record, it has a rise of 74′ and a maximum cross

section of 11" × 46". Possible variations and effects with arch design are limited only by the imagination of the designer.

DESIGN

Beams

Symmetrically tapered beams, uniformly loaded, should be designed for bending moment at the midpoint of beam using the section modulus of the beam at that point. A check should be made at the quarter point of the beam using the moment and section modulus at the quarter point. An approximate deflection can be obtained by assuming an average moment of inertia.

Straight tapered beams uniformly loaded should be designed using the bending moment at the midpoint of the beam and the section modulus at the midpoint. A check should be made at the quarter point. An approximate deflection can be obtained by using the average of the moments of inertia at the ends.

Arches

A three-hinged arch is a statically determinate structure and conventional methods are used for design. Complete design information for the three-hinged and two-hinged arch can be obtained from the Southern Pine Association.

EXAMPLE
DESIGN OF A STRAIGHT GLUED LAMINATED BEAM

Design a beam with a span of 30'-0" and spacing of 8'-0"

Design loads — Live load	— 20	psf
Wt. of beam	— 2.5	psf
Wt. of 2" T&G Deck	— 5.4	psf
Wt. of 5 ply roof	— 6.5	psf
	34.4	psf

Use 35 psf.

Use economical lumber combination 1-8* having following allowable stresses:

- (f) bending — 2400 psi
- ($c_\perp$) compression perpendicular to grain — 385 psi
- (c) compression parallel to grain — 2000 psi
- (H) horizontal shear — 200 psi
- (E) modulus of elasticity — 1,800,000 psi

*See "Standard Specifications for the Design & Fabrication of Structural Glued Laminated Southern Pine."

Maximum moment at centerline (M)

$$M = \frac{wL^2}{8} \times 12$$

$$M = \frac{280 \times 30^2 \times 12}{8} = 378{,}000 \text{ in.-lbs.}$$

M = Maximum moment, in.-lbs.
w = load in lbs. per lineal foot
= 35 × 8 = 280 #/ft.
S = Section modulus, in.^{3}
L = span (feet)

Section Modulus

$$S = M/f = \frac{378{,}000}{2400} = 157.5 \text{ in.}^3$$ (see footnote 2) (see footnote 1)

Section Modulus of 5" × 14 5/8" beam = 178 in.^{3} (table page 5).

End Shear

$$\text{Total shear } (V) = \frac{wL}{2} = \frac{280 \times 30}{2} = 4200 \#$$

$$\text{Total allowable shear } (V) = \frac{2}{3} \text{ times cross section}$$

times allowable unit shear (H)
Allowable horizontal shear (H) = 200 psi (see footnote 1)
Area of 5" × 14 5/8" = 73.1 sq. in. (table page 5).

$$\text{Allowable } V = \frac{2}{3} \times 200 \times 73.1 = 9746 \text{ Lbs.}$$

Footnote 1: If live load is assumed to be snow load, allowable fiber stress and unit shear may be increased 15%.

Footnote 2: Choose a section having a depth to width ratio nearest 4 and with the least board feet of lumber or cross sectional area (table page 5).

Deflection

Check for deflection using live load.
(Deflection due to dead load will be cambered out)

$$D = \frac{5\,Wl^3}{384\,EI}$$

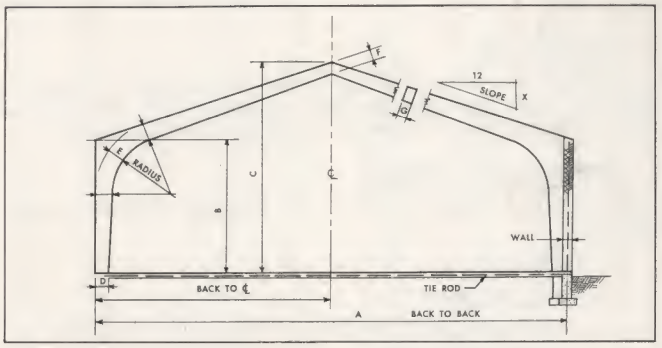
$$D = \frac{5 \times 4800 \times 360^3}{384 \times 1{,}800{,}000 \times 1303}$$

D = 1.24"

$$\text{Deflection} = \frac{1.24}{360} = \frac{1}{290} \text{ of Span}$$

W = Total live load on beam
= 20 × 8 × 30 = 4800#
l (span) = 30 × 12 = 360 inches
E = 1,800,000 psi
I = Moment of inertia
1303 in.^{4} (Table page 5)

DETAIL DRAWING OF A LOW "V" ARCH



A = Span, back to back
B = Wall height
C = Rise
D = Depth at base
E = Depth at knee
F = Depth at crown
G = Width

In describing the arch, it is customary to use the radius of curvature of inner laminations. Nominal 1" Southern Pine laminations can be readily bent to a radius of curvature of 7'-0", which is considerably less than any other softwood species used in structural gluing.

SPECIFICATIONS FOR GLUED LAMINATED BEAMS AND ARCHES

1. FABRICATION

Structural glued laminated members shall be fabricated in accordance with the "Standard Specifications for Structural Glued Laminated Southern Pine" adopted by the Southern Pine Inspection Bureau, National Design Specifications and the American Institute of Timber Construction Standards.

Fabrication shall be in accordance with the best practices, with adequate plant and equipment, and under the supervision of properly qualified personnel.

The fabricator shall provide adequate facilities and equipment so that laminations are prepared, selected, spread, laid up, clamped and cured within the adhesive manufacturers specified time limits.

Laminations to be scarf jointed and glued end-to-end and cured to form continuous one-piece, full length laminations. Each full length lamination then to be surfaced to a uniform thickness to assure close contact of the wood surfaces.

Clamping methods shall be such that the presure is as uniform as practicable over the whole area. Clamping may start at any point, but shall progress to an end or ends. Gluing pressure shall be at least 100-150 pounds per square inch.

2. MATERIALS

a. Lumber—the laminating lumber shall be kiln-dried Southern Pine, with a moisture content of 8 to 14% and of grades or combinations of grades which will provide working stresses as follows:

(Suggested combination—See "Standard Specifications for Structural Glued Laminated Southern Pine" for other stresses)

Stress in extreme fiber (bending)	"f"	2400 psi
Tension parallel to grain	"t"	2600 psi
Compression parallel to grain	"c"	2000 psi
Shear parallel to grain	"H"	200 psi
Compression perpendicular to grain	"C⊥"	385 psi
Modulus of elasticity	"E"	1,800,000 psi

The visible outer lamination shall be selected for clearness, uniformity of grain, and other appearance characteristics. (This provision required only where the appearance of the exposed face is important.)

b. Adhesives—laminating adhesives shall comply with Federal Specifications C-G-456 for casein glue. (For exterior or submerged conditions, use a resin glue of the phenol, resorcinol or melamine type conforming to either of the joint military specificatons JAN-A-397 or MIL-A-5534)

3. SHOP DRAWINGS

The fabricator shall furnish complete shop drawing showing necessary details and shall obtain the Architect's approval before beginning fabrication.

4. HARDWARE

The fabricator shall furnish the base and crown connections required for arches and shall furnish also the bolts required for their use except for anchor bolts embedded in concrete or attached to structural steel.

5. APPEARANCE GRADE

Exposed faces of members to have the following appearance grade: (Select One)

I. PREMIUM

1. Application

Premium appearance grade is for uses which require the finest appearance.

2. Specifications

a. Laminations may contain the natural growth characteristic of the lumber grade.

b. In exposed surfaces, voids which cannot be properly filled shall be replaced with clear wood inserts. This includes knot holes and loose knots in excess of ¾" in diameter. Voids ¾" in diameter and under shall have wood inserts or wood filler. At time of placement, insert shall be selected with special care to match grain and color. All such work shall be done by the fabricator.

c. Soffit and face board material shall be clear and selected with reasonable care to match color and grain at scarf and edge joints.

d. Exposed faces shall be surfaced smooth.

II. ARCHITECTURAL

1. Application

Architectural appearance grade is ordinarily suitable for construction where appearance is an important requirement. Any small voids shall be filled by others than the fabricator if the final decorative finish so requires.

2. Specifications

a. Laminations may contain the natural growth characteristics of the lumber grade.

b. In exposed surfaces, voids which cannot be properly filled shall be replaced by the fabricator with clear wood inserts. This includes knot holes and loose knots in excess of ¾" in diameter. At time of placement, insert shall be selected with reasonable care to match grain and color. Filling of any remaining voids, if required, shall be left to other trades.

c. Soffit and face boards shall be free of loose knots and open knot holes. The material shall be selected with reasonable care to match color and grain at scarf and edge joints.

d. Exposed faces shall be surfaced. Misses are not permitted.

III. INDUSTRIAL

1. Application

Industrial appearance grade is ordinarily suitable for construction in industrial plants, warehouses, garages, and for other uses where appearance is not of primary concern.

2. Specifications

a. Laminations may contain the natural growth characteristics of the lumber grade.

b. Inserts or wood fillers are not required.

c. Soffit or face boards shall be free of loose knots and open knot holes.

d. Members shall be surfaced two sides only, permitting an occasional miss along individual laminations.

6. FINISHING AND SHIPPING

Exposed faces of members to receive the following factory-applied finish application (dependent upon the type of appearance grade selected):

I. STAINED, SEALED AND SPAR VARNISHED

First coat—stain as selected by architect

Second coat—sealer

Third coat—spar varnish

Arches and beams to be individually wrapped in a moisture resistant non-staining furniture wrap paper. Loaded material including purlins to be covered with a load wrap for protection in transit. (The above finish is recommended for Premium Appearance Grade only.)

II. PENETRATING SEALER

First coat—penetrating sealer

Final stain and varnish finishing to be applied in field.

Arches and beams to be individually wrapped in a moisture resistant non-staining furniture wrap paper. Loaded material including purlins to be covered with a load wrap for protection in transit. (The above finish is recommended for Premium Appearance Grade only.)

III. PAINT PRIMED OR SEALER COAT

First coat—primer or sealer

Final paint coats, if any, to be applied in field.

Loaded material to be covered with a load wrap for protection in transit. The above finish is not recommended for those Appearance Grades where final finish includes stain or varnish.

IMPORTANT

A complete factory finish including spar varnish is recommended for best protection of glued laminated structural members. Only the Premium Appearance Grade provides a smooth surface free of knot holes or voids. This is the ideal grade whenever stain or varnish finishes are contemplated. Both the Architectural and Industrial Appearance grades permit voids and knot holes which may require field patching or plugging.

PROPERTIES OF SECTIONS
GLUED LAMINATED STRUCTURAL LUMBER

1-⅝ Inch Laminations Only

Arranged in order of ascending section modulus.

Nominal Width in Inches	Number of 1⅝" Laminations*	Net Finished Size* in Inches b ▽	Net Finished Size* in Inches d ▽	Area of Section in Square Inches	Moment of Inertia $I = \frac{bd^3}{12}$	Section Modulus $S = \frac{bd^2}{6}$	Bd. Ft. Per Lin. Ft.	Weight Per Lin. Ft. Lbs.
3	4	2¼ x	6½	14.6	51.5	15.8	2.00	3.65
4	4	3¼ x	6½	21.1	74.4	22.9	2.67	5.27
3	5	2¼ x	8⅛	18.3	101.	24.8	2.50	4.58
5	4	4¼ x	6½	27.6	97.3	29.9	3.33	6.90
6	4	5 x	6½	32.5	114.	35.2	4.00	8.13
3	6	2¼ x	9¾	21.9	174.	35.7	3.00	5.48
4	5	3¼ x	8⅛	26.4	145.	35.8	3.33	6.60
6	4	5¼ x	6½	34.1	120.	37.0	4.00	8.52
5	5	4¼ x	8⅛	34.5	190.	46.8	4.17	8.63
3	7	2¼ x	11⅜	25.6	276.	48.5	3.50	6.40
4	6	3¼ x	9¾	31.7	251.	51.5	4.00	7.92
6	5	5 x	8⅛	40.6	223.	55.0	5.00	10.15
6	5	5¼ x	8⅛	42.7	235.	57.8	5.00	10.67
5	6	4¼ x	9¾	41.4	328.	67.3	5.00	10.35
4	7	3¼ x	11⅜	37.0	399.	70.1	4.67	9.25
8	5	7 x	8⅛	56.9	313.	77.0	6.67	14.22
6	6	5 x	9¾	48.8	386.	79.2	6.00	12.20
6	6	5¼ x	9¾	51.2	406.	83.2	6.00	12.80
4	8	3¼ x	13	42.3	595.	91.6	5.33	10.58
5	7	4¼ x	11⅜	48.3	521.	91.7	5.83	12.07
6	7	5 x	11⅜	56.9	613.	108.	7.00	14.22
8	6	7 x	9¾	68.3	541.	111.	8.00	17.07
6	7	5¼ x	11⅜	59.7	644.	113.	7.00	14.93
4	9	3¼ x	14⅝	47.5	847.	116.	6.00	11.88
5	8	4¼ x	13	55.3	778.	120.	6.67	13.82
6	8	5 x	13	65.0	915.	141.	8.00	16.25
4	10	3¼ x	16¼	52.8	1,162.	143.	6.67	13.20
10	6	9 x	9¾	87.8	695.	143.	10.00	21.95
6	8	5¼ x	13	68.3	961.	148.	8.00	17.07
8	7	7 x	11⅜	79.6	859.	151.	9.33	19.90
5	9	4¼ x	14⅝	62.2	1,108.	152.	7.50	15.55
6	9	5 x	14⅝	73.1	1,303.	178.	9.00	18.27
5	10	4¼ x	16¼	69.1	1,520.	187.	8.33	17.28
6	9	5¼ x	14⅝	76.8	1,369.	187.	9.00	19.20
10	7	9 x	11⅜.	102.	1,104.	194.	11.67	25.50
8	8	7 x	13	91.0	1,282.	197.	10.67	22.75
6	10	5 x	16¼	81.3	1,788.	220.	10.00	20.33
5	11	4¼ x	17⅞	76.0	2,023.	226.	9.17	19.00
6	10	5¼ x	16¼	85.3	1,877.	231.	10.00	21.33
12	7	11 x	11⅜	125.	1,349.	237.	14.00	31.25
8	9	7 x	14⅝	102.	1,825.	250.	12.00	25.50
10	8	9 x	13	117.	1,648.	254.	13.33	29.25
6	11	5 x	17⅞	89.4	2,380.	266.	11.00	22.35
5	12	4¼ x	19½	82.9	2,626.	269.	10.00	20.73
6	11	5¼ x	17⅞	93.8	2,499.	280.	11.00	23.45
8	10	7 x	16¼	114.	2,503.	308.	13.33	28.50
12	8	11 x	13	143.	2,014.	310.	16.00	35.75
5	13	4¼ x	21⅛	89.8	3,339.	316.	10.83	22.45
6	12	5 x	19½	97.5	3,090.	317.	12.00	24.38
10	9	9 x	14⅝	132.	2,346.	321.	15.00	33.00
6	12	5¼ x	19½	102.	3,244.	333.	12.00	25.50
14	8	12½ x	13	163.	2,289.	352.	18.67	40.75
6	13	5 x	21⅛	106.	3,928.	372.	13.00	26.50
8	11	7 x	17⅞	125.	3,332.	373.	14.67	31.25
6	13	5¼ x	21⅛	111.	4,124.	390.	13.00	27.75
12	9	11 x	14⅝	161.	2,867.	392.	18.00	40.25
10	10	9 x	16¼	146.	3,218.	396.	16.67	36.50
6	14	5 x	22¾	114.	4,906.	431.	14.00	28.50
8	12	7 x	19½	137.	4,325.	444.	16.00	34.25
14	9	12½ x	14⅝	183.	3,258.	446.	21.00	45.75
6	14	5¼ x	22¾	119.	5,151.	453.	14.00	29.75
10	11	9 x	17⅞	161.	4,284.	479.	18.33	40.25
12	10	11 x	16¼	179.	3,933.	484.	20.00	44.75
6	15	5 x	24⅜	122.	6,034.	495.	15.00	30.50
16	9	14½ x	14⅝	212.	3,780.	517.	24.00	53.00
6	15	5¼ x	24⅜	128.	6,336.	520.	15.00	32.00
8	13	7 x	21⅛	148.	5,499.	521.	17.33	37.00
14	10	12½ x	16¼	203.	4,470.	550.	23.33	50.75
6	16	5 x	26	130.	7,323.	563.	16.00	32.50
10	12	9 x	19½	176.	5,561.	570.	20.00	44.00
12	11	11 x	17⅞	197.	5,235.	586.	22.00	49.25
6	16	5¼ x	26	137.	7,690.	592.	16.00	34.25
8	14	7 x	22¾	159.	6,868.	604.	18.66	39.75
16	10	14½ x	16¼	236.	5,185.	638.	26.67	59.00
14	11	12½ x	17⅞	223.	5,949.	666.	25.67	55.75
10	13	9 x	21⅛	190.	7,071.	669.	21.67	47.50
8	15	7 x	24⅜	171.	8,448.	693.	20.00	42.75
12	12	11 x	19½	215.	6,797.	697.	24.00	53.75
16	11	14½ x	17⅞	259.	6,901.	772.	29.33	64.75
10	14	9 x	22¾	205.	8,831.	776.	23.33	51.25
8	16	7 x	26	182.	10,250.	789.	21.33	45.50
14	12	12½ x	19½	244.	7,724.	792.	28.00	61.00
12	13	11 x	21⅛	232.	8,642.	818.	26.00	58.00
8	17	7 x	27⅝	193.	12,300.	890.	21.67	48.25
10	15	9 x	24⅜	219.	10,860.	891.	25.00	54.75
16	12	14½ x	19½	283.	8,960.	919.	32.00	70.75
14	13	12½ x	21⅛	264.	9,820.	930.	30.33	66.00
12	14	11 x	22¾	250.	10,790.	949.	28.00	62.50
8	18	7 x	29¼	205.	14,600.	998.	24.00	51.25
10	16	9 x	26	234.	13,180.	1,014.	26.67	58.50
14	14	12½ x	22¾	284.	12,270.	1,078.	32.67	71.00
16	13	14½ x	21⅛	306.	11,390.	1,078.	34.67	76.50
12	15	11 x	24⅜	268.	13,280.	1,089.	30.00	67.00
8	19	7 x	30⅞	216.	17,170.	1,112.	25.33	54.00
10	17	9 x	27⅝	249.	15,810.	1,145.	28.33	62.25
8	20	7 x	32½	228.	20,030.	1,232.	26.67	57.00
14	15	12½ x	24⅜	305.	15,090.	1,238.	35.00	76.25
12	16	11 x	26	286.	16,110.	1,239.	32.00	71.50
16	14	14½ x	22¾	330.	14,230.	1,251.	37.33	82.50
10	18	9 x	29¼	263.	18,770.	1,283.	30.00	65.75
8	21	7 x	34⅛	239.	23,180.	1,359.	28.00	59.75
12	17	11 x	27⅝	304.	19,320.	1,399.	34.00	76.00
14	16	12½ x	26	325.	18,310.	1,408.	37.33	81.25
10	19	9 x	30⅞	278.	22,070.	1,430.	31.67	69.50
16	15	14½ x	24⅜	353.	17,500.	1,436.	40.00	88.25
8	22	7 x	35¾	250.	26,650.	1,491.	29.33	62.50
12	18	11 x	29¼	322.	22,940.	1,569.	36.00	80.50
10	20	9 x	32½	293.	25,750.	1,584.	33.33	73.25
14	17	12½ x	27⅝	345.	21,960.	1,590.	39.67	86.25
16	16	14½ x	26	377.	21,240.	1,634.	42.67	94.25
10	21	9 x	34⅛	307.	29,800.	1,747.	35.00	76.75
12	19	11 x	30⅞	340.	26,980.	1,748.	38.00	85.00
14	18	12½ x	29¼	366.	26,070.	1,782.	42.00	91.50
16	17	14½ x	27⅝	401.	25,470.	1,844.	45.33	100.25
10	22	9 x	35¾	322.	34,270.	1,917.	36.67	80.50
12	20	11 x	32½	358.	31,470.	1,936.	40.00	89.50
14	19	12½ x	30⅞	386.	30,660.	1,986.	44.33	96.50
16	18	14½ x	29¼	424.	30,240.	2,068.	48.00	106.00
10	23	9 x	37⅜	336.	39,160.	2,095.	38.33	84.00
12	21	11 x	34⅛	375.	36,430.	2,135.	42.00	93.75
14	20	12½ x	32½	406.	35,760.	2,201.	46.67	101.50
10	24	9 x	39	351.	44,490.	2,282.	40.00	87.75
16	19	14½ x	30⅞	448.	35,560.	2,304.	50.67	112.00
12	22	11 x	35¾	393.	41,880.	2,343.	44.00	98.25
14	21	12½ x	34⅛	427.	41,390.	2,426.	49.00	106.75
10	25	9 x	40⅝	366.	50,290.	2,476.	41.67	91.50
16	20	14½ x	32½	471.	41,480.	2,553.	53.33	117.75
12	23	11 x	37⅜	411.	47,860.	2,561.	46.00	102.75
14	22	12½ x	35¾	447.	47,590.	2,663.	51.33	111.75
10	26	9 x	42¼	380.	56,560.	2,678.	43.33	95.00
12	24	11 x	39	429.	54,380.	2,789.	48.00	107.25
16	21	14½ x	34⅛	495.	48,020.	2,814.	56.00	123.75
10	27	9 x	43⅞	395.	63,350.	2,888.	45.00	98.75
14	23	12½ x	37⅜	467.	54,380.	2,910.	53.67	116.75
12	25	11 x	40⅝	447.	61,460.	3,026.	50.00	111.75
16	22	14½ x	35¾	518.	55,210.	3,089.	58.67	129.50
10	28	9 x	45½	410.	70,650.	3,105.	46.67	102.50
14	24	12½ x	39	488.	61,790.	3,169.	56.00	122.00
12	26	11 x	42¼	465.	69,130.	3,273.	52.00	116.25
16	23	14½ x	37⅜	542.	63,090.	3,376.	61.33	135.50
14	25	12½ x	40⅝	508.	69,840.	3,438.	58.33	127.00
12	27	11 x	43⅞	483.	77,420.	3,529.	54.00	120.75
16	24	14½ x	39	566.	71,680.	3,676.	64.00	141.50
14	26	12½ x	42¼	528.	78,560.	3,719.	60.67	132.00
12	28	11 x	45½	501.	86,350.	3,795.	56.00	125.25
16	25	14½ x	40⅝	589.	81,020.	3,988.	66.67	147.25
14	27	12½ x	43⅞	548.	87,980.	4,010.	63.00	137.00
12	29	11 x	47⅛	518.	95,930.	4,071.	58.00	129.50
14	28	12½ x	45½	569.	98,120.	4,313.	65.33	142.25
16	26	14½ x	42¼	613.	91,130.	4,314.	69.33	153.25
12	30	11 x	48¾	536.	106,200.	4,357.	60.00	134.00
14	29	12½ x	47⅛	589.	109,010.	4,627.	67.67	147.25
12	31	11 x	50⅜	554.	117,180.	4,652.	62.00	138.50
16	27	14½ x	43⅞	636.	102,060.	4,652.	72.00	159.00
14	30	12½ x	48¾	609.	120,680.	4,951.	70.00	152.25
16	28	14½ x	45½	660.	113,820.	5,003.	74.67	165.00
14	31	12½ x	50⅜	630.	133,160.	5,287.	72.33	157.50
16	29	14½ x	47⅛	683.	126,460.	5,367.	77.33	170.75
16	30	14½ x	48¾	707.	139,990.	5,743.	80.00	176.75
16	31	14½ x	50⅜	730.	154,470.	6,133.	82.67	182.50

*Other sizes may be obtained. Greatest economy will result by using standard widths and depths that are multiples of standard board and dimension lumber thicknesses.

OUR LADY QUEEN
OF PEACE CHURCH
MADISON, WISCONSIN

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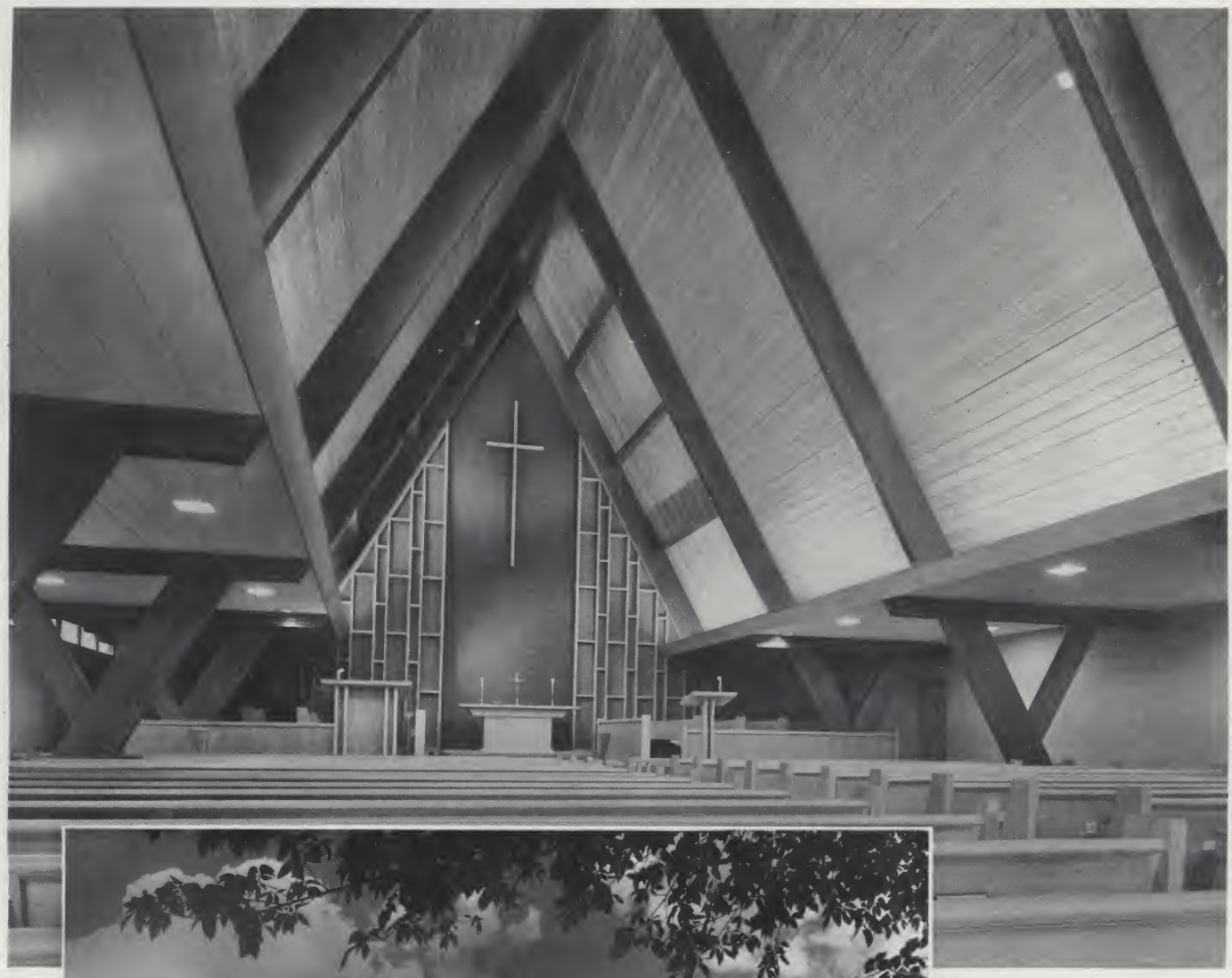
Weiler and Strang



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MADISON, WISCONSIN

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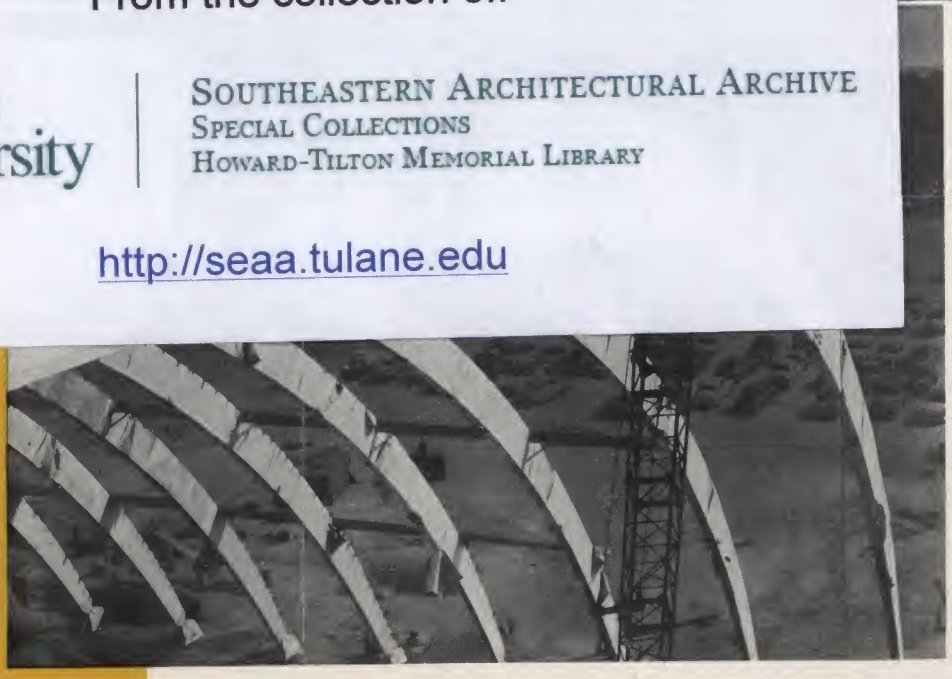

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